TOURNIQUET

Field Of The Invention

The present invention relates to tourniquets generally, and to field tourniquets in particular.

Background Of The Invention

A tourniquet is a device that is intended to stop bleeding from traumatic wounds in the arms and legs. Essentially, tourniquets may be divided into two main categories, namely, those for use in the field, and those for use during surgical procedures in an operating room. Typical types of field tourniquets work by the application of external pressure on a bleeding limb, by use of flexible bands which may or may not be elastic. A disadvantage common to all known field tourniquets is the application of non-regulated pressure (either too much pressure so as to cause unnecessary harm to the subject, or too little pressure so as to be ineffective). A further disadvantage of known field tourniquets is that they cannot normally be applied by the wounded person to himself, and require the presence of a second person for use.

While pneumatically operated tourniquets for hospital use exist, they require connection to a ready supply of pressurize air or electricity, and are thus totally unsuitable for use in the field.

Among known art are the following US patents: Patent No. 4,479,494 entitled *Adaptive pneumatic tourniquet;* Patent No. 4,516,576 entitled *Tourniquet strap or band for restricting blood flow, especially for taking blood samples;* Patent No. 4,520,819 entitled *Tourniquet with differential pressure occlusion detector;* Patent No. 4,520,820 entitled *Automatic tourniquet with improved pressure resolution;* Patent No. 4,548,198 entitled *Automatic tourniquet;* Patent No. 4,671,290 *entitled Automatic tourniquet;* Patent No. 5,048,536 entitled *Tourniquet for regulating applied pressures;* Patent No.

5,181,522 entitled *Tourniquet for sensing and regulation of applied pressure*; Patent No. 5,254,087 entitled *Tourniquet apparatus for intravenous regional anesthesia*; Patent No. 5,439,477 entitled *Tourniquet apparatus for applying minimum effective pressure*; Patent No. 5,540,714 entitled *Disposable tourniquet*; Patent No. 5,556,415 entitled *Physiologic tourniquet for intravenous regional anesthesia*; Patent No. 5,584,853 entitled *Tourniquet cuff apparatus*; Patent No. 5,607,447 entitled *Physiologic tourniquet*; Patent No. 5,649,954 entitled *Tourniquet cuff system*; Patent No. 5,741,295 entitled *Overlapping tourniquet cuff system*; Patent No. 5,842,996 entitled *Automatic tourniquet system*; Patent No. 5,855,589 entitled *Physiologic tourniquet for intravenous regional anesthesia*; Patent No. 5,911,735 entitled *Time-limited physiologic tourniquet*; Patent No. 5,931,853 entitled *Physiologic tourniquet with safety circuit*; Patent No. 6,213,939 entitled *Hazard monitor for surgical tourniquet systems*; Patent No. 6,299,629 entitled *Automatic tourniquet system*; Patent No. 6,589,268 entitled *Hazard monitor for surgical tourniquet systems*; and Patent No. 6,682,547 entitled *Tourniquet cuff with identification apparatus*.

Summary Of The Invention

It is thus an aim of the present invention to provide a self-regulating tourniquet which accurately regulates the pressure applied to a wound, which is simple to use, may be self-applied by a subject, and which is fully portable so as to be suitable for use in the field.

Detailed Description Of The Drawings

The present invention will be more fully understood and appreciated form the following detailed description, taken in conjunction with the drawings, in which:

Fig. 1 is a schematic representation of a self-regulating inflatable tourniquet constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 2A is a cross-sectional view of a self-regulating inflatable tourniquet constructed and operative in accordance with a first embodiment of the present invention, during application;

Figs. 2B and 2C are enlarged cross-sectional views of the operating system of the tourniquet seen in Fig. 2A, in positions prior to and during application, respectively;

Fig. 3A is a view similar to that of Fig. 2A, but showing the self-regulating inflatable tourniquet in a position subsequent to application;

Fig. 3B is an enlarged cross-sectional view of the operating system of the tourniquet seen in Fig. 3A;

Fig. 4 is an enlarged cross-sectional view of an adjustable pressure regulator employed in the self-regulating inflatable tourniquet of the resent invention;

Figs. 5A and 5B are illustrations of a selector employed in the adjustable pressure regulator of Fig. 4, seen in positions of increasing pressure and decreasing pressure adjustment, respectively;

Figs. 6A and 6B are cross-sectional illustrations of a self-regulating inflatable tourniquet constructed and operative in accordance with a further embodiment of the present invention, during and after application, respectively;

Fig. 7 is a cross-sectional view of a self-regulating non-inflatable tourniquet constructed and operative in accordance with yet a further embodiment of the present invention, during application; and

Figs. 8A and 8B are enlarged views of an automatic pressure regulator seen in Fig. 7, during application of the tourniquet and after application thereof, respectively.

Fig. 9 shows a pressure module of a modular self-regulating tourniquet;

Figs. 10A and 10B shows the tourniquet module of modular self-regulating tourniquet with and without the pressure module, wherein the contra member is opened;

Figs. 11A and 11B show the tourniquet module of modular self-regulating tourniquet with and without the pressure module, wherein the contra member is closed and the pressure member is in an inflated state;

Fig. 12 illustrates an implementation of the modular self-regulating tourniquet of the invention adapted to be used on a section of the torso to press a pressure point;

Fig. 13 illustrates applying the modular self-regulating tourniquet on limbs of a human subject; and

Fig. 14 shows an embodiment of the modular self-regulating tourniquet wherein the operation of a number of modular self-regulating tourniquets, which may be embedded in wearable articles such as uniforms, is controlled by a controller.

Detailed Description Of The Invention

As described above, it is an aim of the present invention to provide a self-regulating tourniquet which accurately regulates the pressure applied to a wound, which is simple to use, may be self-applied by a subject, and which is fully portable so as to be suitable for use in the field.

In the present application, a number of different types of self-regulating tourniquet are exemplified. Specifically, one type is a self-regulating inflatable tourniquet, such as exemplified in Figs. 1-6B and 9-14, while a non-inflatable type is exemplified in Figs. 7-8B.

Referring now initially to Fig. 1, there is illustrated a self-regulating inflatable tourniquet, referenced generally **10**, which includes an inflatable pressure member **12** and a contra member **14**, which cooperate so as to form pressure applicator apparatus.

Pressure member **12** and contra member **14** are connected via a yoke **16**. Pressure member **12** is floatingly supported via a pressure regulator **18** to which yoke **16** is fixed. Contra member **14**, however, which preferably is an elongate, flexible, belt like member, is attached at a first end **20** to a first side **22** of yoke **16**, and has a second, free end **24**, which is looped around a limb **26** to which the tourniquet is to be applied, and threaded through a second side **28** of yoke **16**. Subsequently, the contra member **14** is pulled tight, and fastened down as via Velcro® or other equivalent fastening system, indicated at **54**.

Inflatable pressure member **12** is adapted to be pressurized by a pressurized gas or liquid pressure source **30**, the pressure from which may be restricted by a suitable valve **32**, so as not to over-pressurize the inflatable pressure member. Pressure regulator **18** is disposed between valve **32** and inflatable pressure member **12**, and is operative to restrict the pressure transferred from pressure source **30** to limb **26**, to a desired maximum pressure applied to the subject limb. Various examples of pressure regulator **18** are shown and described hereinbelow, in detail.

Reference is now made to Fig. 2A, in which is illustrated a specific embodiment of the self-regulating inflatable tourniquet shown and described above in conjunction with Fig. 1, in accordance with a first preferred embodiment of the present invention. Where appropriate, all parts of the illustrated tourniquet that have counterparts described above in conjunction with Fig. 1, are not specifically described again herein, and are denoted by similar reference numerals, but with the addition of the prefix **"2"**.

Referring now also to Figs. 2B and 2C, pressure regulator **218** is seen to have an inverted generally cup-shaped housing **240**, onto which is mounted a support **229** for pressure source **230**. Housing **240** has a pressure inlet **242**, through which a pressurized fluid is received; an inner chamber **244**; an outer chamber **246** for seating a hollow pressure transfer element **248**

through which pressurized fluid is transferred to inflatable pressure member **212**; and a waist portion **250** disposed between inner and outer chambers **244** and **246**. An excess pressure valve **252** is also provided, in the side wall of inner chamber **244**.

Pressure transfer element **248** is formed so as to include a sealing pin **254**, adapted to seal pressure inlet **242** when forced thereagainst; a hollow intermediate portion **256**, having a central passage **258** and pressure inlets **260** formed in the side wall thereof, and adapted for travel through an opening **262** formed by waist portion **250**; and a flared portion **264**, formed integrally with inflatable pressure element **212**, and through which central passage **258** opens into the interior of pressure element **212**. A seal **263** is provided in opening **262**, thereby to prevent an escape of pressurized fluid from inner chamber **244** to outer chamber **246**. A compression element, referenced **266**, is mounted over sealing pin **254**, thereby to determine the resistive force which must be overcome by pressure transfer element **248** in order for sealing pin **254** to be forced against pressure inlet **242** so as to seal it and thus prevent further inflation of inflatable pressure element **212**, and thus prevent application of additional pressure to the limb **26**.

In the present example, support **229** for pressure source **230** is seen to include resilient side portions **268** which has inward-facing teeth **270** adapted to contact the pressure source **230** so as to be forced resiliently apart by the partial insertion therebetween of the pressure source **230**, as seen in Fig. 2B, and so as to apply a gripping force thereto. The length of support **229** is such that when the pressure source is held between teeth **270**, a fluid dispensing nozzle **231** of pressure source **230** is not engaged with pressure inlet **242**, and thus no pressurized fluid is dispensed. In accordance with a preferred embodiment of the invention, in which pressure source **230** is an aerosol or similar device, the pressurized fluid therein is dispensed by an axial depression of nozzle

231, such as would occur when depressing pressure source **230** against a shoulder portion **243**.

Use of the tourniquet **210** is thus as follows:

Prior to use, tourniquet **210** is positioned by placing pressure member **212** over a required site on limb **26**, and is fastened in position by looping contra member **214** about the limb, and fastening it, as shown.

A cap **235** (Fig. 2B) is then removed from pressure source support **229**, and pressure source **230** is then pressed downwardly with respect to the support **229**, so that nozzle **231** becomes engaged with shoulder **243**, so as to initiate dispensing of the pressurized fluid from pressure source **230**. The bottom end **237** of pressure source **230** becomes displaced beyond teeth **270**, such that the pressure source **230** is held in fluid dispensing position thereby.

As seen in Figs. 2A and 2C, the pressurized fluid dispensed from pressure source **230** flows through pressure inlet **242** and into inflatable pressure member **212**, via inner chamber **244**, pressure inlets **260**, and central passage **258**. As the pressure member **212** inflates against limb **26**, the pressure thereagainst builds, due to the presence of contra member **214** in the illustrated, fastened position.

During this time, the pressure transfer element **248** is held in an open position with respect to the pressure inlet **242** by compression member **266**, and will remain in an open position as long as the resistive force of the compression member **266** is greater than an opposing force applied thereto by pressure member **212**, via pressure transfer element **248**.

Referring now to Figs. 3A and 3B, as the pressure applied to limb **26** by pressure member **212** and contra member **214** builds, however, to a magnitude sufficient to overcome the resistance of compression member **266**, pressure transfer element **248** is displaced outwardly, through housing **240**, until sealing pin **254** engages pressure inlet **242**. At this point, the pressure within inflatable pressure member **212**, and thus the

pressure applied to limb **26**, ceases to increase, having reached a predetermined magnitude.

Subsequently, in the event that there is a pressure loss, for example, caused by a sharp drop in temperature, the pressure transfer element **248** will be forced away from pressure inlet **242** by compression member **266**, thereby permitting pressurized fluid to pass through inlet **242** so as to cause a partial re-inflation of pressure member **212**, until the predetermined pressure is reached once again.

Conversely, in the event that there is a pressure increase, which may be caused, for example, by a sharp increase in temperature, any excess pressure is automatically released by excess pressure valve **252**.

Referring now briefly to Fig. 4, there is illustrated a pressure regulator **418** which is generally similar to pressure regulator **218** shown and described above in conjunction with Figs. 2A-3B, but in which it is possible to adjust the pressure to be applied by the tourniquet device of the present invention. All components and portions forming part of adjustable pressure regulator **418**, and having counterparts in pressure regulator **218**, and denoted herein with similar reference numerals, and are not specifically shown and described again herein.

It is clear that the magnitude of the pressure, referred to herein also as "designated pressure", which is applied by the tourniquet of the present embodiment of the invention, is dictated by the resistive force of the compression element **266**, and the travel of pressure transfer element **248** before engagement of the pressure inlet **242** by sealing pin **254**.

It will be appreciated by persons skilled in the art, that in some cases it is desirable to be able to adjust the designated pressure. Accordingly, in accordance with the present embodiment of the invention, a camming mechanism is provided for adjusting the travel required by the pressure

transfer element **248** before sealing pin **254** engages the pressure inlet **242**.

Camming mechanism includes an apertured cam plate **470**, mounted onto a free end of compression member **466**, and a cam **472** which is mounted about a pivot axis **474**. A selector lever **476** is attached to cam **472** so as to facilitate manual selection of a lower designated pressure, as illustrated in Fig. 5A, or a higher designated pressure.

Reference is now made to Figs. 6A and 6B, in which is illustrated a further embodiment of the self-regulating inflatable tourniquet shown and described above in conjunction with Fig. 1. Where appropriate, all parts of the illustrated tourniquet that have counterparts described above in conjunction with Fig. 1, are not specifically described again herein, and are denoted by similar reference numerals, but with the addition of the prefix **"6"**.

Pressure regulator **618** is seen to employ a pressure transfer element **648** which is adapted to pivot about a pivot axis **647** whose location is preferably fixed with respect to the pressure source **630**. Element **648** is hollow, and fluid passing thereinto from pressure source **630**, is conveyed through element **648**, to a flexible fluid conduit **658**, which passes through a sensor positioning plate **611** (whose function is described hereinbelow) mounted onto inflatable pressure member **612**, and into the interior of pressure member **612**. A distal end **649** of transfer element **648**, is pivotably connected to a pressure sensing member **680**, at a floating pivot axis **682**.

Pressure sensing member **680** is seen to have a resilient cusp element **682**, which is arranged to lie against an outer surface of inflatable pressure member **612**, and is confined between the pressure member **612** and positioning plates **611**. The function of the positioning plates is solely to maintain cusp element **682** in pressure sensing relation with pressure member **612**.

Pressure sensing member **680** further includes a rigid force transfer member **684**, which affords a rigid connection between cusp element **682** and distal end **649** of transfer element **648**.

In operation, after initial positioning of the tourniquet **610** on the limb **26** generally as described above, aerosol nozzle **631** is engaged with pressure transfer element **648**, so as to release pressurized gas into inflatable member **612**, via conduit **658**. As member **612** is inflated, the increase in pressure forces pressure sensing member **680** in an outward direction, causing a flattening of resilient cusp element **682**, thereby also forcing force transfer member **684** in a similarly, outward direction.

As force transfer member **684** is travels outwardly, it rotates pressure transfer element **648** in the illustrated, anti-clockwise direction, thereby causing a disengagement thereof from nozzle **631**. Once complete disengagement is achieved, the flow of pressurized gas stops, so as to stabilize the tourniquet pressure at the designated pressure.

Referring now to Fig. 7, the present invention also includes, as described above, a self-regulating non-inflatable tourniquet, of which one example is shown and described herein. Where appropriate, all parts of the presently illustrated tourniquet that have counterparts described above in conjunction with Figs. 1-6B, are not specifically described again herein, and are denoted by similar reference numerals, but with the addition of the prefix "**7**".

In the present embodiment, the contra member **714** is looped about a pulley **790**, and also functions as a pressure source, in conjunction with a manually applied pulling force. The pulley **790** has a typically circular locking element **792** fixable mounted thereon, against which the contra member **714** is pulled, as the tourniquet is tightened. Locking element **792** has a plurality of locking recesses **794** formed thereon, whose function is described hereinbelow.

Referring now also to Figs. 8A and 8B, a pressure sensing member **780** is resiliently mounted on the underside of a pair of positioning plates **711**, via a resilient element **782**. Pressure sensing member terminates in a locking pin **754**, for selectively engaging an adjacent locking recess **794**.

In operation, after initial positioning of the tourniquet **710** on the limb **26** generally as described above, contra member **714** is looped through pulley **790**. As it continues to be pulled, shown schematically by arrow **796** in Fig. 8A, and the pressure increases, the pressure regulator **718** is forced inwardly, so that retaining plates **711** depress resilient element **782**. As thus continues, locking element **792** is forced into contact with locking pin **754**, until an adjacent locking recess **794** is lockably engaged thereby, so as to trap the contra member **714** therebetween, thus stabilizing the pressure on the limb **26** at the designated pressure.

By using liquefied gas as the source of the pressure and by employing its inherent liquid/gas phase's steady-state pressure, we can use the same embodiment as in Fig. 2A without the need of a pressure regulator. When the device is activated, the liquefied gas flow into the inflatable bladder and produce a pressure inherent to its chemical composition. We will apply this physical phenomenon to regulate the pressure applied to a limb. Further more, the proximity of the bladder to the limb will regulate the temperature the gas is subjected to and will help stabilizing the pressure on the limb at the designated pressure.

Figs. 9, 10A-10B and 11A-11B illustrate another preferred embodiment of the invention wherein the self-regulating tourniquet comprise two distinct modules, a pressure module **90** (Fig. 9), and a tourniquet module **100** (Fig. 10). The pressure module **90** consists of a housing **98** comprising a pressure source **91** disposed therein. The opening of nozzle **96** of pressure source **91** is in fluid connection with the inner chamber **95** provided in housing **98**. Inner chamber **95** comprises

a sealing pin **95** and a pressure transfer element **93**. A male fitting **92** is provided at one end of housing **98** where an opening of inner chamber **95** is formed. Male fitting **92** is adapted to engage a respective female fitting **102** provided on the tourniquet module **100** and thereby to provide a sealed closure of inner chamber **95**.

When the pressure module **90** is attached to the tourniquet module **100** the opening **97** of central passage of pressure transfer element **93** is placed in connection with aperture **101** provided in female fitting **102** of tourniquet module **100**. Aperture **101** is in fluid connection with the interior of pressure member **105**, such that a fluid passage from inner chamber **95** via central passage of pressure transfer element **93** and aperture **101** is obtained when pressure module **90** is attached to tourniquet module **100**. Pressure member **105** is attached to the bottom side of female fitting **102** and it is adapted to be inflated by pressurized fluid that is released from pressure source **91** when the pressure module **90** is attached to the tourniquet module **100**.

Pressure member **105** comprise a firm member **106** disposed at its bottom side and adapted to deliver direct pressure to a specific point on limb **26**, thus causing a specific blood vessel to close, as shown in Fig. 11B. A contra element **103** comprising two flexible members is attached to the side of the female fitting **102**. Fastening means **104** are provided at the free ends of the members of the contra element **103** for forming a closed loop when the tourniquet module is fastened around limb **26**, as shown in Figs. 11A-11B wherein the pressure member is shown in an inflated state.

The procedure of applying the modular tourniquet of the invention comprise fastening the members of the contra element **103** of the tourniquet module **100** around limb **26** via fastening means **104**, attaching the pressure module **90** to the tourniquet module **100** via male **92** and female **102** fittings. Pressure member **105** may be inflated either manually by attaching a

manual inflation device thereto (not shown in Figs. 9, 10A-10B and 11A-11B), or automatically by attaching pressure module **90** to the tourniquet module **100** such that the inner valve of pressure module **90** is opened, thereby inflating the pressure member **105**. This modular self-regulating tourniquet is simple to use, may be self-applied by a subject, and is fully portable so as to be suitable for use in the field.

Pressure module **90** is preferably made of an impact resist polymer, such as lexan, and it may be manufactured by an injection molding process. The height of pressure module **90** is generally in the range of 30-60 mm, preferably about 45 mm, its diameter is generally in the range of 15-50 mm, preferably about 25 mm, the diameter of inner chamber **95** is generally in the range of 12-40 mm, preferably about 25 mm, and the diameter of male fitting **92** is generally in the range of 10-30 mm, preferably about 20 mm. Pressure source **91** is preferably a type of gas container filled with liquefied gas (e.g., tetrafluoro ethane) in pressures of a bout 5 bar and volumes of about 12 cc.

Sealing pin **94** is preferably made of a type of polymer such as polypropylene, and it may be manufactured by an injection molding process. The diameter of the sealing pin **94** is generally in the range of 2-5 mm, preferably about 3 mm, and the diameter of its base is generally in the range of 5-12 mm, preferably about 6 mm. Pressure transfer element **93** is preferably made of a type of polymer such as polypropylene, and it may be manufactured by an injection molding process. The outer diameter of pressure transfer element **93** is generally in the range of 15-40 mm, preferably about 25 mm, and the inner diameter of the passage provided thereinside is generally in the range of 12-35 mm, preferably about 20 mm.

The length of contra elements **103** is generally in the range of 400-800 mm, preferably about 700 mm, their widths are generally in the range of 40-80 mm, preferably about 60 mm, and they may be manufactured from any material suitable for

this purpose (e.g., leather, plastic, rubber). Pressure member **105** may be manufactured from any material suitable for this purpose (e.g., rubber) and may be inflated to volume ranges of 100-600 cc. Female fitting **102** may be manufactured by an injection molding process from a type of polymer such as polypropylene its outer diameter is generally in the range of 20-60 mm, preferably about 30 mm, its inner diameter is determined according to the diameter of male fitting **92** to allow a sealed connection therebetween, and the diameter of opening **101** may be determined according to the inner diameter of the passage of pressure transfer element **93**, for instance about 20 mm. Fastening means **104** may be implemented by a cord lock clip buckle or Velcro® strips for instance.

Figs. 12-13 demonstrate application of the self-regulating tourniquet of the invention to specific pressure points of a human subject **120**. In Fig. 12, the self-regulating tourniquet module **100** is specially adapted to apply direct pressure to a section of the torso. For this purpose two or more contra elements may be attached to the sides of tourniquet module **100**, and fastened over torso sections. For example, one contra element **121** may be fastened over the a shoulder opposite to the location in which the tourniquet module **100** is applied, and another contra element **122** may be fastened around the torso as shown in Fig. 12.

Fig. 13 demonstrates application of tourniquet modules **100** of the invention to an arm and a leg of a human subject **120**.

The tourniquet modules **100** can be attached or be part of a built-in system being part, for example, of uniforms, were the pressure member **105** is attached on the upper part of the limbs (arms and legs), thereby providing a quick installation and operation of the tourniquet without requiring application of the same around the limbs, an operation that will most probably require assistance in case of serious injuries.

The modular tourniquet **100** of the invention may be pressurized by a liquefied gas contained in pressure source **91** which may be embodied as a low pressure canister such as an aerosol, utilizing liquefied gases such as HFC (hydrofluoro carbon) like tetra fluoro ethane or compressed gas such as Nitrogen or Carbon Dioxide or air. Alternatively, the modular tourniquet **100** of the invention may be pressurized by a pump, electric or mechanical pump for building the required pressure.

The pressure regulation may be performed utilizing mechanical means like an over pressure valve as shown in Fig. 1 or by electronic sensing as used in the portable self administered electronic blood pressure devices known in the art. These devices measure the turbulent flow of the blood by utilizing sensors that are attached to the skin of the subject, thus they are capable of diagnosing the blockage of the blood flow via a limb. These devices may be programmed to detect when there is no blood flow via an organ and for generating respective control signals for keeping the tourniquet pressure within a corresponding pressure range to maintain blood flow blockage. This will allow a control unit to apply the absolute minimum pressure required to stop the turbulent flow. In case wherein blockage of the laminar blood flow is required, a somewhat higher pressure rage may be needed, which may be easily achieved by suitable programming of the control unit.

The pressure unit can be either static part or otherwise be attached when needed. These preferred embodiment of the invention would shorten the time that is needed to install the tourniquet unit and will allow for the single wounded man to operate it by himself.

The same unit when using the automated blood pressure monitoring device can be made to operate on a remote command or by sensing the drop of blood pressure to a certain level or

by measuring the changes in electro conductivity of the skin or by other similar means.

Fig. 14 demonstrates a possible embodiment utilizing a control unit **145** for regulating the pressure applied by the tourniquet modules **100**. In this preferred embodiment the inflation of the pressure member **105** of the tourniquet modules **100** is controlled via suitable means such as controllable valves (not shown), which are linked to controller **145** via conducting wires **146**. In this preferred embodiment of the invention the tourniquet modules **100** may be embedded in wearable articles such as uniforms. Pressure module **90** may be attached to each tourniquet module **100** separately or to a central point operable for applying pressure to each of the tourniquet modules **100** via controllable valves (not shown). Blood pressure sensors **140** are optionally embedded in the uniform below the location of each tourniquet module **100**, where said sensors are also electrically connected to controller **145** via conducting wires **146**. When embodied in uniforms for example, wires **146** may pass within the uniform may be stitched thereto.

When the blood pressure monitoring is carried out by electronic means as done in the different automatic blood pressure measuring devices, the electronic data can be automatically or on request, transmitted to a central command of the unit allowing each commander to know the physiological state of its troops. The whole system can be made modular with a changeable and removable pressure unit or each module can contain its own pressure unit.

It will be appreciated by persons skilled in the art that the scope of the present invention is not limited by what has been shown and described hereinabove, merely by way of example. Rather, the scope of the present invention is limited solely by the claims, which follow: